The State of New Hampshire
DEPARTMENT OF ENVIRONMENTAL SERVICES

Robert R. Scott, Commissioner

WATER CONSERVATION PLAN APPROVAL

March 13, 2018

Craig Carrigan
Berlin Water Works
55 Willow Street
Berlin, NH 03570
craig@bwwberlinnh.org

Transmitted via Email

Subject: **Berlin – Berlin Water Works (PWS ID #: 0231010)**
Water Conservation Plan, NHDES # 170121

Dear Mr. Carrigan:

On March 2, 2018, the New Hampshire Department of Environmental Services ("DES") Drinking Water and Groundwater Bureau received a Water Conservation Plan (the "WCP"), signed on February 12, 2018, for Berlin Water Works located in Berlin, New Hampshire. Pursuant to RSA 485:61 and Env-Wq 2101, community water systems seeking permits from DES for new sources of groundwater shall submit a water conservation plan to DES. Based on review of the WCP, DES has determined the WCP complies with Env-Wq 2101, *Water Conservation* rules.

Pursuant to Env-Wq 2101, the City of Berlin and the North Country Council were provided a copy of the WCP, along with other required materials.

DES approves the WCP based on the following conditions:

1. No later than source activation, all source meters, distribution meters, meters measuring water consuming processes, and any transfer meters and data loggers shall be installed.

2. Upon source activation, source meters and any other meters measuring water consuming processes prior to distribution shall continue to be read at least monthly (no sooner than 27 days and no later than 33 days from the last meter reading).

3. The system shall continue to report monthly water use for sources and destinations to the DES Water Use Registration and Reporting Program on a quarterly basis.

4. Meters shall continue to be installed on all service connections and points of transfer to consecutive water systems and privately owned redistribution systems that are added to the system.

5. Service meters shall continue to be read at least quarterly (no sooner than 83 days and no later than 97 days from the last meter reading).

6. Within 2 years of source approval, a conservation rate structure shall be implemented for residential connections.

    a. Residents shall be charged based on the amount of water each residence uses, and the rate shall be structured so that the cost per gallon(s) is either constant or increasing with the amount of water used.

7. Upon source approval, a water balance (the difference between the system input volume and the metered authorized consumption) shall be reported annually to DES. The water balance shall be reported by March 1 for the prior year using the online reporting tool.

8. All meters shall be installed per the manufacturer's instructions or American Water Works Association standards.

9. Upon source activation, all meters shall be tested and maintained based on the schedule proposed in the WCP.

10. Within one year of source approval, a leak detection and repair program shall be implemented in accordance with the WCP.

11. Leaks shall be repaired within 60 days of discovery.

12. From the date of this approval, all new non-metallic pipes installed in the system shall be outfitted with detectable tracer tape or detectable tracer wire, or be GPS located and maintained in a GIS system.

13. No later than source activation, a water conservation outreach and education program shall be implemented in accordance with the WCP.

14. Within 5 business days of source approval, any consecutive water systems or privately owned redistribution systems receiving water from this system shall be contacted and informed of the proposed source activation date as well as a statement indicating that upon source activation, they will be required to comply with Env-Wq 2101.

15. Within 60 days of obtaining source approval, the system shall send copies of the certified mail return receipts requested in #14., above, to DES.

16. Every three years from the date of this approval, a *Water Conservation Plan Ongoing Compliance Reporting Form* shall be submitted to DES documenting how the system has maintained compliance with the WCP. The following records shall be maintained by the water system to include with the report:

    a. A leak log including the date a leak was discovered, the date a leak was repaired, the type of leak (ex. water main, service line, hydrant, valve), the approximate size of the leak (gpm), and the nearest address to the leak.

    b. The title of water efficiency materials distributed and the date of distribution.

c. Date of installation and replacement of all meters as well as testing and calibration records.

d. Leak detection activities summary.

17. Proposed changes to the WCP shall not be implemented unless approved by DES.

The online *Annual Water Balance Reporting Form* and the *Water Conservation Plan Ongoing Compliance Reporting Form* may be located by going to the DES website (www.des.nh.gov), clicking on the "A-Z List" in the top right corner of the page, clicking "Water Conservation," and scrolling down to "Forms/Applications."

Please feel free to contact me with any questions at (603) 271-0659 or via e-mail at kelsey.vaughn@des.nh.gov.

Sincerely,

Kelsey Vaughn

Kelsey Vaughn
Water Conservation Program
Drinking Water and Groundwater Bureau

ec: Debbie Baillgereon, Berlin Water Works
City of Berlin
North Country Council
Steve Roy, Andrew Koff, Stacey Herbold; DES

WATER CONSERVATION PLAN: Berlin Water Works

A community water system seeking authorization for a new source of water must submit a water conservation plan to the New Hampshire Department of Environmental Services (NHDES) for approval demonstrating how the water system proposes to comply with water conservation standards pursuant to Env-Wq 2101, *Water Conservation* rules. Berlin Water Works is an existing large community water system.

Activities outlined in the water conservation plan will be completed by water system personnel under the supervision of a certified water system operator.

I. Introduction

A. Contact Information

1. Name and location of system: Berlin Water Works, City of Berlin, 55 Willow Street, Berlin NH 03570

2. Current owner of system and mailing address: Same as above

3. Name and mailing address of designer of water conservation plan: Same as above

B. System Overview

1. Brief description of the community being served (ex. number of units, apartments, partially attached condos, individual homes, shared common facilities, population, etc.): The water system serves approximately 9,500 people. There is a mix of residential, industrial/commercial/institutional, and municipal customers.

2. Description of water sources, including water sources to be developed for non-potable uses such as irrigation: The primary water source for Berlin Water Works (BWW) is the Ammonoosuc River, which is withdrawn at the Godfrey Dam and treated at the Ammonoosuc water treatment plant (WTP). The WTP has a capacity of 4 MGD. The BWW also utilizes Brown Farm Well #1. It has a capacity of 1,000 gpm and has been used to provide 1.2 MGD over three days or 1.3 MGD for one day while the Ammonoosuc WTP is not in service.

BWW is developing Brown Farm Well #2 so that it will have a fully redundant water supply in the event that the Godfrey Dam, Raw Water Transmission Main, or the Ammonoosuc WTP is suddenly taken out of service.

3. Name designation of each proposed water source and any existing sources:
   Existing: Ammonoosuc River Raw, GPW2 (Brown Farm Well #1)
   Proposed: Brown Farm Well #2

4. Number of connections proposed for each of the following classes:
   a) Residential: 3,203
   b) Industrial/Commercial/Institutional: 150
   c) Municipal: 25

5. Names of any consecutive water systems or privately owned redistribution systems: The NH Department of Corrections (Northern NH Correctional Facility, PWS 0234010) and the Federal Bureau of Prisons (FCI Berlin, PWS 0234020) are consecutive water systems or privately owned redistribution systems.

6. Description of any connections that receive more than 20,000 gpd: BWW has three customers that use more than 20,000 gpd.

1. The Burgess Biopower is a biomass generation plant that uses approximately 1 MGD. It has been in full production for two years.
2. The Federal Bureau of Prisons facility at 1 Success Loop Road has its own 0.5 million gallon water storage tank.
3. The NH Department of Corrections Facility has a pump station at 138 East Milan Road.

Note: The Androscoggin Valley Hospital uses more than 20,000 gpd during some months, but it is not consistently over 20,000 gpd.

7. Please provide the following information based on metered source withdrawal volumes from the last complete year. Please report in gallons.

The average day and maximum day demands are projected to be 1.7 MGD in winter months and 2.4 MGD in summer months. Currently, we are producing 1.8 to 2.0 MGD.

C. Transfer of Ownership

1. The system ownership is not proposed to be transferred.

II. System Side Management

A. Water Meter

1. Source and Other System Side Meters

a) No later than the source activation date, meters will be installed on each new and any existing water source.

b) No later than the source activation date, a distribution meter will be installed to measure flow at the point of entry into the water system.

c) An irrigation well is not proposed.

d) Meter information for each proposed and existing water source and other system side meters:

<u>Ammonoosuc Water Treatment Plant</u>:
Source Meters for Ammonoosuc River:
12” Venturi Meter (Measures withdrawal delivered to treatment plant)
Meter Installation Date: 1995
Last Meter Test/Calibration Date: 1995 (Cleaned and electronics calibrated in August 2017)

8” Krohne Waterflux 3100 (Measures water released from the pressure and surge relief valve)
Meter Installation Date: February 2016
Last Meter Test/Calibration Date: December 2015 (purchased)

Distribution Meters:
12” Venturi Meter
Meter Installation Date: 1995
Last Meter Test/Calibration Date: 1995

4” Venturi Meter
Meter Installation Date: 1995
Last Meter Test/Calibration Date: 1995

Brown Farm Well Control Building:
Source/Distribution Meter:
Brown Farm Wells #1 and #2
12” Venturi Meter
Meter Installation Date: 2012 (Moved from the Androscoggin WTP to the Brown Farm Well Control Building in 2012)
Last Meter Test/Calibration Date: 1995 (Cleaned in 2012 prior to reinstallation in Brown Farm Well Control Building. Meter electronics were calibrated in August 2017.)
Note: These wells may be metered separately, as determined by the NHDES Hydrology and Engineering Sections.

e) No later than the source activation date, source meters and other system side meters will be read daily. The SCADA system will be used to monitor the sources on a continuous basis. BWW also performs a direct manual read of each of its sources on a daily basis to confirm the SCADA-recorded data.

2. Service Meter Installation, Reading, and Maintenance

a) Service meters are installed on all service connections and all points of transfer to consecutive water systems and privately owned redistribution systems.

b) Service meters will be read at least every 90 days. Most customers are read every 90 days, but we also have 48 meters that are read monthly for customers using an average greater than 600 gpd.

c) Service meters will be read by: touch pad read, walk by read, or drive-by read. Approximately half of the system is radio read.

d) It is expected it will take approximately 10 days to read all service meters in the city.

e) Service meters will be maintained in accordance with II.A.3.e), below as well as the following:

(1) Presently, the BWW has 136 meters that are over 20 years old, 1335 meters that are 15-20 years old, 995 meters that are 10-15 years old, and 882 meters that are 0-10 years old. The BWW will continue to replace/repair approximately 4-6% of its meters (134-201 meters) on an annual basis.

(2) BWW will test 5% of the meters scheduled for replacement each year in order to build a database of meter data, including actual meter accuracy, meter age, total volume of water passed through the meter, estimated flow rate, water quality, and meter manufacturer. The data will be used to determine accuracy estimates for meters and in cost-benefit decisions regarding meter replacement.

(3) If the water balance exceeds 15% losses in a year, BWW will implement a more aggressive service meter change-out schedule based on the data collected in II.A.2.e)(2), above.

(4) Meter age as well as service location determine priorities for replacement. For instance, services with larger meters, in the tenement section of the city, or in hilly sections of the system have a high priority.

(5) Older meters are being replaced by iPERL meters that have no moving parts and tend to be quite accurate. The iPERL meter has a 20-year accuracy warranty and a 20-year battery life guarantee. In a recent analysis, we compared the bills for customers that had their old meters replaced with the iPERL meters, and we found a 7% increase in revenue as a result of the upgrade.

(6) The BWW maintains an extensive and detailed GIS system to track all work performed at each service location as well as all work performed in the distribution system itself.

(7) Service meters greater than 1" are owned by the customer, who is in charge of testing them. However, BWW requires those customers to replace the meters after 20 years and tracks usage (daily, monthly, or quarterly) to determine if testing or downsizing is needed. For instance, BWW has used its metering and billing software to flag meters that are under- or over-registering when compared to that meter's history, resulting in the downsizing of approximately 95 ¾"-inch diameter meters over the past year.

(8) If the water balance exceeds 15% losses in a year, service meters greater than 1" will be assessed for accuracy through review of records, inspection of the meter, and meter testing.

3. Meter Selection, Installation, and Maintenance

a) All meters will be American Water Works Association (AWWA) certified, with the exception of b), below.

b) AWWA does not have standards for magnetic flow meters. If a magnetic flow meter is proposed, the meter make, model, size and manufacturer specifications will be forwarded to the NHDES Water Conservation program for review. The meter will not be installed until receiving

approval for its use from NHDES. It is noted that AWWA anticipates issuing a standard for magnetic flow residential cold-water meters used for billing purposes in 2018. Magnetic flow service meters used in the BWW system will comply with these standards when they are issued.

c) The selected size of the meters will be based on projected flow rates.

d) Meters will be installed as specified by the manufacturer, including requirements for horizontal or vertical placement, distance of straight run of pipe upstream and downstream of the meter and strainer installation. If the manufacturer does not supply installation specifics, meters will be installed in accordance with the "Manual of Water Supply Practices M6, Water Meters-Selection, Installation, Testing, and Maintenance" (AWWA, 2012).

e) The following meter testing and calibration schedule or meter change-out schedule will be implemented for all meters not addressed in II.A.3.f), below. If the manufacturer's accuracy warranty extends beyond the schedule below, the meter will be tested or changed-out no later than the warranty expiration date.

Meter Size (inches)	Testing Rate (years)
<1"	10 yrs
1" - 2"	4 yrs
3"	2 yrs
>3"	1 yr

f) The following meter testing and calibration schedule or meter change-out schedule will be implemented for the venturi and mag meters measuring raw water and distribution water:

(1) Within 1 year of source approval, the venturi source and distribution meters at the Ammonoosuc Water Treatment Plant will be inspected using an internal camera. If the inspection indicates that build-up is present, BWW will remove the meter, document the build-up, and clean the meter. Based on the results of the camera inspection and/or cleaning, a proposed schedule for the future rate of inspection/cleaning will be submitted to NHDES.

(2) Within 1 year of source approval, the Krohne mag meter measuring the water discharged from the pressure and surge relief valve will be serviced, maintained, and calibrated in accordance with manufacturer's directions/requirements and the AWWA C751-16 Magnetic Inductive Flowmeters standard. If required, the meter will be removed and inspected for build-up. The build-up inside the meter will be documented. Based on the results of the meter testing/calibration, build-up observations, and number of years the meter has been in place, a proposed schedule for the future rate of servicing/cleaning will be submitted to NHDES.

(3) Within 1 year of source activation, the venturi meter(s) measuring the well(s) will be inspected using an internal camera. If the inspection indicates that build-up is present, BWW will remove the meter, document the build-up, and clean the meter. Based on the results of the camera inspection and/or cleaning, a proposed schedule for the future rate of inspection/cleaning will be submitted to NHDES.

(4) All source and distribution meters shall be electronically calibrated annually from the date of source approval.

g) A log of the date meters were installed, tested, calibrated, repaired and replaced will be maintained. Calibration certificates will be kept on file.

B. Water Balance and Water Audit

1. The system currently has service meters installed. The previous year's water balance (system input volume – authorized metered consumption) is attached to this WCP and will continue to be reported to NHDES yearly. The water balance for 2016 was 69,885,353 gallons or 10.96%. The adjusted water balance (system input volume-authorized metered consumption-authorized unmetered consumption [not including leakage]) was 54,852,561 gallons or 8.6%.

2. The yearly water balance will be reported to NHDES using the NHDES online water balance reporting tool, and will be submitted no later than March 1 of each year. The electronic reporting form is located on the Water Conservation homepage of the NHDES website.

3. The water system will prepare and submit a water audit and response plan if more than 15% of the system input volume cannot be accounted for by authorized metered consumption. The response plan will identify how the water system intends to reduce losses to below 15% within two years.

4. Water audits will be calculated in accordance with the "Manual of Water Supply Practices M36, Water Audits and Loss Control Programs" (AWWA, 2016).

C. Leak Detection and Repair

1. Description of the system's leak detection program (ex. acoustic leak detection, zone meters, night flow analysis) to be implemented within one year of source approval:

a) The normal leak detection program that the BWW implements consists of trending water usage through the SCADA system to detect possible leaks. We have constant monitoring of flows that allow us to detect if there is higher usage than normal, and we also look at the electric bill. We use booster stations to determine the zone of the possible leak. Acoustic leak detection then occurs in the system. For equipment, BWW has a ground microphone and a magnetic locator tracing machine. All BWW field staff are trained in the use of our leak detection equipment, and all staff receive training periodically through companies such as EJ Prescott and other classes to obtain CEUs.

b) BWW does flushing starting in August and continuing in the fall. During that process, field staff listen to hydrants for possible leaks.

c) We put notifications in the newspaper to notify customers to contact the BWW if they hear water running at their residence when they are not using water.

d) BWW has replaced over 30 miles of its 50-mile distribution system. All pipe is pressure tested prior to going into service. Butt welded HDPE pipe has been used for the majority of the water distribution system improvements. Therefore, leakage is minimal due to new pipe and the elimination of thousands of bell and spigot joints through the use of butt welded HDPE.

2. Non-metal pipes will either be GPS located and stored in a GIS system or equipped with detectable tracer tape or detectable tracer wire during new installation. BWW uses a 12 gauge tracing cable, and all service lines are copper.

3. Leak detection will be conducted in accordance with the "Manual of Water Supply Practices M36, Water Audits and Loss Control Programs" (AWWA, 2016).

4. Leaks will be repaired within 15 days of discovery. A waiver shall be obtained in accordance with Env-Wq 2101.23 if the repair time is greater than 60 days.

5. A log of all leaks will be maintained, including the date the leak was discovered, the date the leak was repaired, the type of leak (ex. service, main, hydrant, valve), the size of the leak (gpm) and the closest street address. BWW also presently tracks all leaks by street location; water main size, material, and age; and operating pressure. This information is then used by BWW during its water main replacement planning.

D. Pressure Management

1. The design pressures of the system are from 20 psi to 143 psi.

2. The system was designed with pressures over 100 psi because it is a gravity-fed system through a PRV. In order to provide water to pump zones at a minimum of 20 psi, we need to have 90 psi at the PRV, which causes pressure in the lower levels to be over 130 psi. Houses in these areas have pressure reducers installed after the meter to reduce pressure to 60 psi.

III. Consumption Side Management

A. Conservation Rate Structure and Billing

1. Within two years of installing all service meters or within five years of source approval, whichever is earlier, a conservation rate structure will be implemented for residential connections. Customers will be charged based on usage, and the rate per unit of water will be uniform (ex. $4.00/1000 gallons of water) or increase with usage (ex. $4.00/0-500 gallons of water, $4.50/501-1000 gallons of water).

2. The rate structure will be submitted to NHDES prior to implementation. BWW currently uses a declining block rate structure, which will need to be revised to meet the Water Conservation rules.

3. Irrigation water will not be billed separately. BWW does not provide water to nurseries/farms/commercial growers. As such, irrigation water is limited to lawn and garden watering by individual customers.

4. Upon implementation of the rate structure, customers will continue to be billed quarterly. Forty-seven customers will continue to be billed monthly (one customer has two meters).

B. Educational Outreach Initiative

1. No later than the source activation date, the system will begin distributing water efficiency outreach materials twice a year with bills. The materials distributed will be either NHDES Water Efficiency Fact Sheets located at http://des.nh.gov/organization/commissioner/pip/factsheets/dwgb/index.htm#efficiency or EPA WaterSense materials located at http://www.epa.gov/watersense/.

2. The system will maintain a log indicating how the system has complied with III. B.1., above. The log will include dates the outreach and education actions were taken and what was done.

C. Winter Water Use

1. In the early 1980s, thousands of residents ran water overnight in an effort to prevent pipes from freezing. BWW has taken several actions since that time to reduce winter nighttime water use. We moved water mains from 2 feet to 6 feet, which has helped warm the water. We have also used a Toronto company to assist residents with installing an in-pipe heating cable, which provides year-round water line freeze protection for the service lines. As of 2017, only 60 homes ran water at night in the winter, and the goal is to get to zero.

IV. Reporting and Implementation

A. Upon installation of all service meters, and by no later than March 1 of each year, a water balance for the previous year will be submitted to NHDES using the electronic reporting form located on the Water Conservation homepage of the NHDES website (www.des.nh.gov).

B. Upon source approval, the water system will continue to report monthly production volumes, quarterly to the NHDES Water Use Registration and Reporting Program. Monthly means once every calendar month, but no sooner than 27 days after and no later than 33 days after the previous reading.

C. The water system will submit a form supplied by NHDES once every three years from the date of the water conservation plan approval documenting how compliance with the requirements of Env-Wq 2101, *Water Conservation* rules, is being achieved. The system may attach the meter, leak and outreach and education logs to the form or fill out the form manually.

I certify that I have read this Water Conservation Plan, understand the responsibilities of the water system as referenced in the plan, and that all information provided is complete, accurate, and not misleading.

Owner Name (print): Craig Corrigan

Owner Signature: Craig Corrigan Date: 2/12/19

Appendix A
Definitions

Authorized metered consumption: billed metered water plus unbilled metered water.

Community water system (CWS): a public water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents.

Consecutive water system: a public water system that buys or otherwise receives some or all of its finished water from one or more wholesale systems for at least 60 days per year.

Final source approval: the date of final well siting approval or the date of issuance of the large groundwater withdrawal permit.

Large community water system: a community water system that serves more than 1,000 persons.

Privately owned redistribution system (PORS): A system for the provision of piped water for human consumption which does not meet the definition of a public water system and meets all of the following criteria:

(1) Obtains all of its water from, but is not owned or operated by, a public water system; (2) serves a population of at least 25 people, 10 household units or 15 service connections, whichever is fewest, for at least 60 days per year; and (3) has exterior pumping facilities, not including facilities used to reduce pressure, or exterior storage facilities which are not part of building plumbing.

Public water system (PWS): a system for the provision to the public of piped water for human consumption, if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year.

Small community water system: a community water system that serves 1,000 people or less.

Source activation date: the date the source is placed into use.

System input volume: the volume of water input to the water supply system after treatment, analysis and storage.

Water balance: the difference between the system input volume and authorized metered consumption.

Water conservation: any beneficial reduction in water losses, waste or use.

Wholesale system: a public water system or an industrial, commercial or institutional (ICI) water user that treats source water and then sells or otherwise delivers finished water to a consecutive water system or privately owned distribution system.

Appendix B
Notification Process

Public Notification Instructions

Once a final draft of the water conservation plan is agreed upon by the applicant and NHDES, NHDES will send a signature line to the applicant for addition to the plan along with a summary of the requirements of Env-Wq 2101, *Water Conservation* rules. Within 10 working days of receiving the summary from NHDES, the applicant is required to provide a copy of the water conservation plan via certified mail with return receipt requested to the governing board of the municipality in which a proposed source is located, all municipalities that will receive water from the water system (if any), all wholesale customers (if any) and the regional planning commission serving the location of the proposed source. In most cases, only the municipality and the regional planning commission will require notification. All signed copies of the certified mail return receipts (the green cards) must be forwarded to NHDES along with the final, signed water conservation plan.

Additional Attachments

The applicant must provide the governing boards with a summary of the requirements of Env-Wq 2101, which may be found at http://des.nh.gov/organization/divisions/water/dwgb/water_conservation/index.htm, and request that the governing board amend local site planning requirements to reflect the requirements of Env-Wq 2101 or to promote water efficiency.

Notification of Consecutive Water Systems and Privately Owned Redistribution Systems

Within 5 working days of obtaining final approval of the source from NHDES, the system is required to notify any consecutive water system or privately owned redistribution system receiving water from the system, that pursuant to Env-Wq 2101.13, the systems must implement a water conservation plan and should contact the NHDES Water Conservation Program using the contact information below.

Kelsey Vaughn, Water Conservationist
New Hampshire Department of Environmental Services
Drinking Water and Groundwater Bureau
PO Box 95
Concord, NH 03302-0095
kelsey.vaughn@des.nh.gov
Phone: (603) 271-0659
Fax: (603) 271-0656

Environmental Services

Water Conservation Annual Water Balance Reporting Form

The New Hampshire Department of Environmental Services (NHDES) Annual Water Balance Reporting Form is for the use of water systems with approved water conservation plans (WCP) and which are implementing water accounting as a part of the WCP.

A water balance compares the volume of water introduced into the distribution system with the volume of authorized consumption which is metered.

Water Balance = System Input Volume - Metered Consumption

The comparison provides a general overview of the water system's potential water losses and non-revenue water. A water balance should not be confused with a water audit, which is a much more detailed assessment of water losses, non-revenue water, and revenue water.

* 1. System Information

System Name:	Berlin Water Works
System Town:	Berlin
Contact Name:	Craig Carrigan
Email Address:	craig@bwwberlinnh.org

* 2. Please provide the time period for which this water balance is based:

	MM	DD	YYYY
Start Date	01	01	2016
End Date	12	31	2016

* 3. What units are you reporting in?

gallons (gal)

Other (please specify)

* 4. What was the system input volume for this time period?

637,647,326

* **5. System input volume: The volume of water input to the water supply system corrected for known errors, which is equal to the volume of water derived from the water system's own sources, minus water consumed by treatment processes, plus water imported or purchased, plus or minus the net change in water storage where applicable.**

Please describe how system input volume was calculated based on the above definition:

Water is metered at the Ammonoosuc Treatment Facility and Brown Farm Well

* **6. What was the volume of Billed Metered Water for this time period?**

562,608,005.52

Billed metered water: The authorized consumption by all customer types that is both metered and billed.

Authorized consumption: The volume of water removed from the distribution system with the explicit or implicit approval of the water supplier. The term includes water used by registered customers, water delivered to consecutive systems, and water consumed in public service activities including but not limited to fire fighting and training, flushing of mains and sewers, street cleaning, watering of municipal gardens, public fountains, frost protection, bleeder valves for water quality improvement, and water used in construction. Authorized consumption is either metered or unmetered and either billed or unbilled, in any combination.

*

7. What was the volume of Unbilled Metered Water for this time period? (Only metered water should be reported here. Question 8 provides the option to report any authorized water use which is unmetered and estimated and/or measured using a method other than metering.)

5,153,966.84

Unbilled metered water: Any authorized consumption that is metered but for which the water supplier does not bill.

8. Not required: Volume of Authorized Consumption that is not metered? Please also state how the system measures/estimates these volumes.

Flushing:	2,919,000
Method for estimating volumes:	417 hydrants x 7,000 gallons per flush
Fires/Training:	500,000
Method for estimating volumes:	Estimated by Fire Department
Leakage:	5,000,000
Method for estimating volumes:	Estimated leak volume x the amount of time leaking
Street Cleaning:	125,000
Method for estimating volumes:	PWD Estimate of tank size and times tank was filled
Irrigation:	n/a
Method for estimating volumes:	
Decorative:	n/a
Method for estimating:	
Other:	11,488,792

Method for estimating other: meter reading when flushing tanks, and see below

9. Comments:

NOTES: 8. Other also includes Blow off at end of distribution line (33,210 gpd x 121 days), overflow of tanks for water quality and emptying tanks for cleaning(based on tank volumes).

Done

CITY OF BERLIN WATER WORKS
FEBRUARY, MAY, AUGUST & NOVEMBER QUARTERLY RATE CHARGES
RESIDENTIAL and COMMERCIAL CUSTOMERS

QUARTERLY RATES

The following rates shall be used for the May 2010 quarterly billing period and shall remain in effect until changed by the Board of Water Commissioners. New usage categories effective January 8, 2014.

	WATER CONSUMPTION CHARGES:					**ASSESSMENT CHARGES:**
	Cost per 100 CUBIC FEET					
1	ZERO	-			.00	$27.00
2	100	-	600	Cubic Feet	$30.00	$27.00
3	601	-	1,600	(Next 1,000)	$2.64	$27.00 plus $3.00 for
4	1,601	-	3,500	(Next 1,900)	$2.07	Each 100 cubic feet
5	3,501	-	4,500	(Next 1,000)	$2.04	Above 600 cubic feet.
6	4,501	-	6,000	(Next 1,500)	$1.98	
7	6,001	-	15,000	(Next 9,000)	$1.93	
8	15,001	-	40,000	(Next 25,000)	$1.82	
9	40,001	-	3,500,000	(Next 3,460,000)	$1.66	
10	3,500,001	-	14,400,000	(Next 10,900,000)		$0.45
11	14,400,001	-	16,800,000	(Next 2,400,000)		$0.45
12	16,800,001	-	20,460,000	(Next 3,660,000)		$0.90
13	20,460,001	-	And over			$1.35

* based on 90 day period

FIRE PROTECTION CHARGE:
Customers with water usage and 1 dwelling unit will not have a separate Fire Protection Charge.

EXAMPLE:	1 dwelling unit	$0.00 (single family house or store)
	2 dwelling units	$5.00
	5 dwelling units	$20.00
	15 dwelling units maximum	$70.00

SPRINKLER HEAD FEE: .10 cents per fixture head per quarter
CUSTOMER CHARGE: $2.05 per Water Account for Customers with no water usage.

HOW TO COMPUTE YOUR WATER BILL: If you have a one-family dwelling and use ZERO cubic feet, bill is $27.00 for Assessment, $5.00 for Fire Protection and $2.05 customer charge = $34.05 per quarter.

If you have a one-family dwelling and use 500 cubic feet, bill is $30.00 for Water, $27.00 for Assessment Charge = $57.00 per quarter.

If you have a one family dwelling and use 1,000 cubic feet, bill is $40.56 ($30.00 + (4 x $2.64) for Water, $39.00 ($27.00 + (4 * $3.00)) for Assessment = $79.56 per quarter.

If you have a one-family dwelling and use 2,000 cubic feet, bill is $64.68 ($30.00 + (10 x $2.64) + (4x $2.07)) for Water, $69.00 ($27.00+(14 * $3.00)) for Assessment = $133.68 per quarter.

If you have a one-family dwelling and use 3,200 cubic feet, bill is $89.52, ($30.00 + (10 x $2.64) + 16 x $2.07)) for Water, $105.00 ($27.00+(26 * $3.00)) Assessment = $194.52 per quarter.

NOTE: For buildings with more than one dwelling unit, add $5.00 per dwelling unit to the above.
EXAMPLE: **If** you have a two-family dwelling unit and your consumption is 3,200 cubic feet, bill would be $89.52 for Water, $105.00 for Assessment, $5.00 for Fire Protection = $199.52 per quarter.

FOR OTHER BILLING CHARGES CONTACT OUR OFFICE: (603) 752-1677 OR WRITE
TO: BERLIN WATER WORKS – 55 WILLOW STREET – BERLIN, NH 03570-1883

Water Rates – May 1, 2010
Lineal Assessment – May 1, 2009
New Usage Categories Jan 8, 2014

CITY OF BERLIN WATER WORKS
MONTHLY RATE CHARGES
INSTITUTIONAL AND INDUSTRIAL CUSTOMERS

New Usage Categories added January 8, 2014. Monthly water rates will be effective December 4, 2013 and shall remain in effect until changed by the Board of Water Commissioners.

MONTHLY RATES

WATER CONSUMPTION CHARGES:

					Cost per 100 CUBIC FEET
1	ZERO	-			.00
2	100	-	200	Cubic Feet	$10.00
3	201	-	533	(Next 332)	$2.64
4	534	-	1167	(Next 633)	$2.07
5	1,168	-	1,500	(Next 332)	$2.04
6	1,502	-	2,000	(Next 499)	$1.98
7	2,001	-	5,000	(Next 2,999)	$1.93
8	5,001	-	13,333	(Next 8,332)	$1.82
9	13,333	-	1,166,667	(Next 1,153,333)	$1.66
10	1,166,668	-	4,800,000	(Next 3,633,332)	$0.45
11	4,800,001	-	5,600,000	(Next 799,999)	$0.45
12	5,600,001	-	6,820,000	(Next 1,219,999)	$0.90
13	6,820,001	-	And over		$1.35

ASSESSMENT CHARGES:

$9.00
$9.00
$9.00 plus $3.00 for Each 100 cubic feet Above 200 cubic feet.

FIRE PROTECTION CHARGE:
Customers with water usage and 1 dwelling unit will not have a separate Fire Protection Charge.

EXAMPLE:	1 dwelling unit	$0.00 (single family house or store)
	2 dwelling units	$1.67
	5 dwelling units	$6.66
	15 dwelling units maximum	$23.33

SPRINKLER HEAD FEE: 3.3 cents per fixture head per month
CUSTOMER CHARGE: $0.68 per Water Account for Customers with no water usage.

HOW TO COMPUTE YOUR WATER BILL-NOTE COST IS PER 100 CUBIC FEET

If you have a one family dwelling and use 1,000 cubic feet, bill is $28.43 ($10.00 +(3.32 x $2.64) +(4.67 X $2.07)) for Water, $33.00 ($9.00 + (8 * $3.00)) for Assessment = $61.43 per month.

If you have a one-family dwelling and use 5,000 cubic feet, bill is $106.40($10.00 + (3.32 x $2.64) + (6.33 x $2.07) +(3.32 x 2.04) + (4.99 x 1.98) +(29.99 x 1.93)) for Water, $153.00 ($29.00+(48 * $3.00)) for Assessment = $259.40 per month.

If you have a one-family dwelling and use 13,333 cubic feet, bill is $258.04, ($10.00 + (3.32 x $2.64) + (6.33 x $2.07) + (3.32 x 2.04) + (4.99 x 1.98) + (29.99 x 1.93) + (83.32 x 1.82)) for Water, $403.00 ($9.00+(131.33 * $3.00)) Assessment = $661.04 per month.

NOTE: For buildings with more than one dwelling unit, add $1.67 per dwelling unit to the above.

EXAMPLE: **If** you have a two-family dwelling unit and your consumption is 5,000 cubic feet, bill would be $106.40 for Water, $153.00 for Assessment, $1.67 for Fire Protection = $261.07 per quarter.

FOR OTHER BILLING CHARGES CONTACT OUR OFFICE: (603) 752-1677 OR WRITE TO: BERLIN WATER WORKS – 55 WILLOW STREET – BERLIN, NH 03570-1883

ACTIVE METER INVENTORY OCTOBER 19, 2017

Year Installed	Age in Years	5/8"	3/4"	1"	1 1/2"	2"	3"	4"	6"	8"	10"	TOTAL
1996	21	134	0	0	0	0	0	0	0	0	0	134
1997	20	251	11	9	0	0	0	0	0	0	0	271
1998	19	153	37	14	0	4	1	0	0	0	0	209
1999	18	313	71	13	0	0	0	0	0	0	0	397
2000	17	183	55	3	4	0	2	0	0	0	0	247
2001	16	149	46	3	2	0	0	0	0	0	0	200
2002	15	93	23	2	0	0	0	0	0	0	0	118
2003	14	17	5	0	0	0	0	0	0	0	0	22
2004	13	103	23	3	0	0	0	0	0	0	0	129
2005	12	76	8	0	0	0	0	0	0	0	0	84
2006	11	265	26	4	0	1	1	0	0	0	0	297
2007	10	298	1	2	0	0	0	0	0	0	0	301
2008	9	212	11	10	1	3	1	1	0	0	0	239
2009	8	139	3	0	0	1	0	0	0	0	0	143
2010	7	27	5	0	0	2	0	0	0	0	0	34
2011	6	16	3	1	0	1	0	0	0	0	0	21
2012	5	19	0	0	0	2	0	0	0	0	0	21
2013	4	38	0	0	0	0	0	0	0	2	1	41
2014	3	94	0	1	6	2	0	0	1	0	0	104
2015	2	69	0	0	1	0	0	0	0	0	0	70
2016	1	117	0	1	1	0	0	0	0	0	0	119
2017	0	151	0	1	1	0	0	1	0	0	0	154
TOTAL		2917	328	67	16	16	5	2	1	2	1	3355

BWW averages about 4% of total meters changed out each year over the past 22 years.

Residential Metered Usage Comparison - Pre/Post 2014
City of Berlin Water Works

NOTES

1. Accounts with iperl meters Installed between Jan 1, 2014 and Jan. 1, 2015
2. All customers are single family customers

								Pre-iPERL water meters		Mix of old and new	New iPERL meters		
Meter ID	Serial #	Outside Nu Radio MIU Num	Location ID	Customer ID	Property Address	Units in Bldg	Year Old Meter was Installed	Usage, CF 2012	Usage, CF 2013	Usage, CF 2014	Usage, CF 2015	Usage, CF 2016	Usage, CF 2017
74289637	same	17071406C	370002	370004	8 Legassie	1	2010	4,800	7,000	4,500	3,700	400	3,600
75728582	same	19252568C	2105002	2105004	805 Fifth Ave	1	2001	3,000	3,700	4,100	3,600	6,100	5,200
77479640	same		2670001	2670001	120 Laurel St	1	2002	3,100	2,600	2,700	7,400	6,400	0
76478422	same	17014412C	2820001	2820004	129 Mt. Forist	1	2004	2,000	2,000	3,900	5,300	4,300	4,400
73991041	same	19923094C	3555002	3555003	39 Jericho Rd	1	2001	4,000	0	2,600	7,600	5,700	5,500
76762077	same	19252842C	4640002	4640002	83 Pleasant	1		12,900	12,800	17,600	27,700	13,700	15,600
77350985	same	80040218C	4687502	4687502	19 Pleasant St	1		22,600	22,800	24,100	24,500	19,200	20,400
76478412	same	19252554C	5080003	5080003	212 Park St	1	1997	6,000	6,000	7,400	5,700	4,600	3,200
75414673	same	19253798C	5385001	5385001	144 Hillside Ave	1	2007	0	2,000	2,000	2,300	2,300	2,100
75728581	same	19253192C	6120001	6120002	226 Prospect St	1	2007	3,500	4,000	4,600	8,300	2,900	5,100
76281172	same	18060798C	6330001	6330002	103 Elm St	1	1999	0	4,000	2,900	3,100	3,000	2,900
76762071	same	18021652C	6515001	6515001	128 Summer St	1	1997	1,900	1,900	1,900	1,900	1,500	1,400
77777022	same	80617892C	7746001	7746001	97 High St	1		1,600	1,400	1,200	600	500	500
76762074	same	80041168C	8115004	8115005	412 School St	1	2009	2,000	2,000	5,700	6,900	5,500	5,900
76478418	same	18021252C	8360002	8360003	107 Spring St	1	2006	3,000	6,000	4,600	5,000	4,800	6,500
74289650	same	19924334C	8395001	8395001	26 Success St	1	2007	5,900	4,500	3,800	3,600	3,400	3,700
76762073	same	19253114C	8595002	8595002	213 Norway St	1	2008	3,900	4,800	4,300	4,600	4,300	3,500
75728584	same	19253678C	8750001	8750001	394 Norway St	1	2007	5,100	6,000	7,100	6,500	2,700	2,900
77350989	same	19924432C	8790001	8790001	442 Norway St	1		3,100	2,300	1,900	1,900	1,500	2,000
77350987	same	80041426C	8870001	8870002	480 Norway	1		2,500	3,700	3,400	2,500	3,000	3,300
77350990	same	18021426C	9610001	9610001	40 Bret St	1	2001	4,900	5,300	5,800	6,400	5,600	5,600
76440420	same	13951734C	9950001	9950001	194 Howard St	1	1998	11,100	12,000	10,800	11,300	8,200	6,800
74289634	same	19924548C	10100001	10100001	38 Williamson Ave	1	2006	4,800	6,200	7,000	7,900	9,100	8,700
76762076	same	19253638C	10165002	10165002	5 Sherry St	1	2008	500	2,400	4,100	6,500	6,100	6,800
73991036	same	15251568C	10310001	10310001	1910 Riverside Dr	1	2004	5,900	5,500	5,900	7,400	7,100	5,900
74289638	same	15725664C	10325001	10325001	1896 Riverside Dr	1	2012	3,500	3,800	3,200	3,800	3,900	3,700
77479635	same	18020776C	10555001	10555001	37 Twelfth St	1	1997	4,200	4,200	4,900	5,500	5,200	4,600
76762072	same	19253020C	10610002	10610002	1679 Riverside Dr	1	2009	6,100	6,400	5,400	4,300	4,700	4,800
76762075		15189582C	11115002	11115002	15 Chalet Loop Rd	1	2005	3,600	3,900	3,600	3,600	3,400	3,200
76478419	same	18059820C	11292501	11292501	3 Pinecrest Ave	1	2000	4,000	4,000	3,300	2,800	2,900	2,500
76440422	same	19253688C	11350001	11350002	7 Page Hill Rd	1	2000	11,200	15,400	14,500	13,100	9,900	8,700
73991038	same	80041218C	11560001	11560001	1716 Hutchins St	1	2014	4,800	4,700	4,600	5,300	5,300	5,400
76478425	same	18445638C	11577501	11577501	1372 Napert St	1	2004	11,200	11,200	6,200	5,300	5,400	4,900
74289630	same	80041416C	11592501	11592502	100 Dutil St	1	1997	1,900	11,100	11,900	12,600	13,200	11,800
76882386	same	19253116C	11655002	11655004	667 Hampshire St	1	1997	0	600	1,000	800	1,400	1,100
75728583	same	19253608C	12145002	12145003	46 Franklin St	1	1999	4,100	4,800	5,100	5,800	4,600	5,200
76478427	same	18060474C	12260002	12260002	179 Bridge St	1	1998	4,600	6,000	4,000	5,800	4,900	4,500
76440426	same	19252592C	12445001	12445001	24 Turcotte St	1	1999	6,400	6,400	3,500	3,800	2,300	2,300
74289652	same	80041304C	13205001	13205002	196 Grafton St	1	1998	2,400	9,900	8,300	8,400	6,700	4,500
77479634	same	17072860C	13915001	13915001	581 King St	1	2005	5,600	5,500	5,600	7,200	13,200	5,000
77479639	same	16124756C	13990002	13990002	577 Cheshire St	1	1998	4,700	4,200	2,700	6,000	5,000	9,400
74289653	same	16134286C	14065001	14065001	585 Sullivan St	1	1998	8,200	6,700	6,600	5,000	3,100	2,600
74020646	same	19253256C	14105001	14105001	482 Rockihgham St	1	1998	3,200	3,200	4,300	6,500	2,600	1,300
							Total Usage, CF/Year	207,800	242,900	242,600	277,800	229,600	217,000
							Average Annual Use per Customer, CF/year	4,833	5,649	5,642	6,460	5,340	5,047
							Average Annual Use per Customer, Gal/Year	36,148	42,253	42,201	48,324	39,940	37,748